

***In situ* Remediation of Sites Contaminated with Organic Compounds Using Iron-Catalyzed Persulfate as an Oxidant**

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In situ chemical oxidation (ISCO) technologies have been used for degradation of organic compounds in soil and groundwater at hazardous waste sites. However, some commonly used oxidants, such as the Fenton's reagent and permanganates, have limitations for ISCO applications and therefore cannot be universally applied. Chemical oxidation using iron-catalyzed persulfate (ICP) results in the formation of a highly reactive sulfate free radical. Use of ICP potentially represents an innovative technology for the *in situ* treatment of soils and groundwaters contaminated with organic compounds, including chlorinated solvents such as trichloroethylene (TCE).

The objective of the proposed laboratory-scale study is to determine the full range of capabilities and limitations of the use of ICP for the destruction of TCE in soil and groundwater. Experiments are being conducted on select contaminant(s) to study interactions between the contaminant, oxidant, ferrous and ferric forms of iron, and a chelating agent. Aqueous samples of the target contaminant were prepared in the laboratory. Experiments were conducted in the laboratory under controlled conditions. Analysis of contaminants in the aqueous medium was conducted in accordance with appropriate U.S. Environmental Protection Agency (U.S. EPA) methods. Iron, pH, persulfate ion, chelating agent, and target contaminants were monitored during the experiments. Based on preliminary experiments conducted at the UMASS Lowell Civil & Environmental Engineering Laboratory, ICP appears to be a superior ISCO oxidant due its persistence potential. Based on results from limited experiments, it appears that ferric iron in the presence of the chelant forms ferrous ions that activate the sulfate free radicals. These sulfate free radicals are then able to degrade the target organic contaminants. In the natural environment (i.e., soil and groundwater), iron is generally found in the ferric form. The experimental results suggest that native iron from sites, if available at appropriate levels, may be utilized to catalyze the oxidation reactions. Additional experiments are being carried out jointly at the Civil & Environmental laboratory at UMASS Lowell and at the U.S. EPA's New England laboratory in North Chelmsford, MA.